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## Research Article

***Verbena brasiliensis* Vell.: a new record of an invasive alien species in the flora of Turkey**

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## OPEN ACCESS

**Abstract**

*Verbena brasiliensis*, the Brazilian Vervain, is a flowering plant species from Verbenaceae family. It is native to parts of South America, but has spread its range in recent times. During floristic surveys in Bartın province in northern Turkey, a new alien species for the country (*Verbena brasiliensis*, Verbenaceae) was found. Only two *Verbena* species were previously known from Turkey. We present an identification key and description of morphological characters of the species, as well as notes regarding the habitat where it was found.

**Key words:** invasive alien plant, morphology, Northern Turkey, taxonomy, Verbenaceae

**Introduction**

According to recent studies, Verbenaceae includes about 34 genera with approximately 1035 species, mainly distributed in tropical and subtropical regions, particularly in Southeast Asia, Central and South America and the West Indies, with few species occurring in the temperate zones (Gorshkova 1974; Leary 2006; Munir 2002; Xu and Chang 2017). *Verbena* L. was originally described by Linnaeus (1753) with 14 species. Since then, several authors worked on *Verbena* and today this genus is represented by 107 species, which are mainly spread in subtropical and tropical countries of America, some of them growing in Europe (Portugal, Italy, and Spain), Asia, Africa, and Australia (Yeo 1990; Kolakovskii 1986; Mikeladze et al. 2017; Almeida 1999; Soldano 2000; Verloove 2006).

*Verbena brasiliensis* naturally exists in parts of South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, and Uruguay (cf. Yeo 1990), and then it has become a widespread invasive alien plant in many other parts of the world: North America (Perry 1933), Oceania (Munir 2002), Africa (Eriksson et al. 1979; Turland 1994), Asia (Verloove 2006), and Europe (Probst 1949; Clement and Foster 1994).

In Turkey, two species of *Verbena* have been recorded until today. These are *V. officinalis* L. and *V. supina* L. (Townsend 1982; Güner et al. 2012). With this study, a third *Verbena* species is recorded as a new alien species for the country.

## Materials and methods

During the field studies around the Bartın province in northern Turkey, plant samples belonging to *Verbena* were collected in June 2020. The collected samples were checked according to the Flora of Turkey and its supplements and according to A Checklist of the Flora of Turkey (Vascular Plants) (Townsend 1982; Davis 1988; Güner et al. 2000) and after a detailed review of the literature they were identified as *Verbena brasiliensis* (Townsend 1982; Güner et al. 2012; Uludağ et al. 2017; Perry 1933). The collected specimens were deposited in the Bartın University Ulus Vocational School Plant Samples Laboratory and Herbarium of Duzce University Faculty of Forestry (DUOF).

In this study, the morphological description of *Verbena brasiliensis* was based on the available literature (Yeo 1990; Perry 1933) and the microscopic examination of collected plants as herbarium material. The distribution map of *V. brasiliensis* in Turkey was created according to the grid system in Flora of Turkey (Townsend 1982). Data on the spread of species, condition of the populations and characteristics of the habitats inhabited by *V. brasiliensis* in Turkey are based on field research and presented in this article.

## Results and discussion

### *Nomenclature*

*V. brasiliensis* Vellozo, Fl. Flum. 1: pl. 40, 17. 1829. syn. *Verbena litoralis* Kunth, var. *brasiliensis* (Vellozo) Munir, J. Adelaide Bot. Gard. 20: 71. 2002, non Briquet 1904.

After the new species of *Verbena* is recorded for Turkey, a new identification key is as below:

1. Erect perennial herbs, leaves irregularly serrate-dentate or pinnatifid ... 2
  - . Prostrate or ascending annual herbs, leaves bipinnatisect ..... *V. supina*
2. Inflorescences densely glandular, spikes lax, leaves irregularly pinnatifid ..... *V. officinalis*
  - . Inflorescences eglandular, spikes dense, leaves serrate-dentate..... *V. brasiliensis*

### *Species description*

*Verbena brasiliensis* Vell. (Figure 1) is one of a small group of tall, rigid, perennial plants with narrow leaves, long middle internodes and small, blue-violet to purplish flowers. Stems up to 190 (–250) cm, much-branched from base, branches erect, quadrangular, puberulous or almost glabrous. Leaves are generally sessile, lower and middle 4–10 cm long and 1.5–3 cm wide, rhombic-lanceolate or lanceolate; base clasping or cuneate; margin evenly or slightly unevenly serrate, with the tothing not very coarse and



**Figure 1.** *Verbena brasiliensis* Vell. A. Habit in the field. B. Flower-spike with subsidiary spike. C. Two vegetative internodes of main stem. D. Flowers. Photographs by B. Tunçkol.

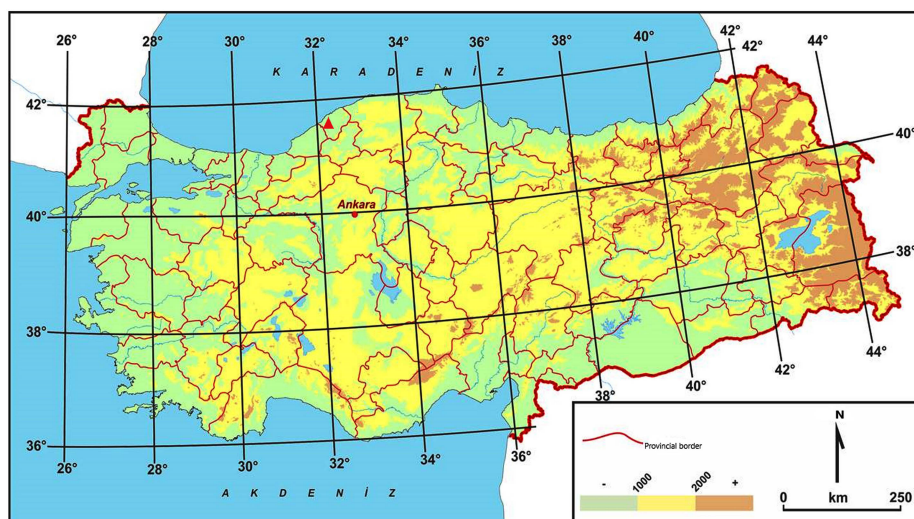
the basal portion entire. Upper leaves c. 7 cm × 4–11 mm, entirely or sparsely toothed, smaller than lower leaves, narrowly lanceolate, base attenuate or cuneate, apex acute.

The inflorescence is a lax terminal panicle with long branches ending in a spike. Spikes dense. Usual dimensions of lower spikes (mm) 15–45 × 5.5–6.5. Bracts 2.25–4 mm long, lanceolate, hispid or pubescent, subulate at apex, ciliate. Calyx 5-toothed, 1.5–2.5 mm long, finely strigillose-pilose outside, glabrous inside. Corolla pubescent outside, corolla-limb inconspicuous, bluish-purple, mauve or lilac, longer than calyx, tube 2–2.5(–3) mm long. Anthers situated in the upper third of the corolla tube. Nutlets c. 1.2–1.7 mm long, muricate-scabrous.

#### *Habitat and distribution in Turkey*

Turkey (Western Black Sea Region; Figure 2): A4-Bartın, Karasu village of 0–10 m, 41°40'N; 32°14'E, roadside and ruderal areas, 29.05.2020, B. Tunçkol 5850. Flowering time late spring and summer (May–July). It spreads in ruderal areas along the roadside in an area of almost 20 ha in groups. In the habitat where *Verbena brasiliensis* grows, the following species accompany it: *Capsella bursa-pastoris* (L.) Medik., *Cardamine hirsuta* L., *Cerastium*





**Figure 2.** Distribution map of *Verbena brasiliensis* in Turkey.

*glomeratum* Thuill., *Clematis vitalba* L., *Geranium asphodeloides* Burm.f., *Medicago lupulina* L., *Medicago polymorpha* L., *Parentucellia latifolia* Caruel, *Periploca graeca* L., *Platanus orientalis* L., *Plantago lanceolata* L., *Plantago major* L., *Populus nigra* L., *Rubus canescens* DC., *Salix alba* L., *Sanguisorba minor* Scop., *Sherardia arvensis* L., *Smilax excelsa* L., *Symphotrichum squamatum* (Spreng.) G.L.Nesom, *Thlaspi perfoliatum* L. and *Veronica persica* Poir.

*Verbena brasiliensis* is similar to *V. litoralis* and *V. bonariensis* but apparently, it is distinguished by the difference in inflorescence. The spikes of *V. brasiliensis* are short, compact, sessile, and regularly arranged in open cymes, whereas those of *V. litoralis* and *V. bonariensis* are longer, compact or somewhat elongated, pedunculate, and arranged in more or less paniculate cymes (Perry 1933).

Invasive species are one of the greatest threats to natural biodiversity and the sustainability of ecosystems. Accordingly, this newfound naturalized alien species suppresses the growth of natural herbal plants in the area. There is a Filyos river which is a stopover used by migrating birds in the area, so it is estimated that these birds disperse the seeds of the plant. It is possible that this new recorded alien species can be seen in other regions of Turkey and continue to suppress the natural flora. Therefore, the spread of alien species except for natural conditions and their transition from one country to the other should be kept under control.

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